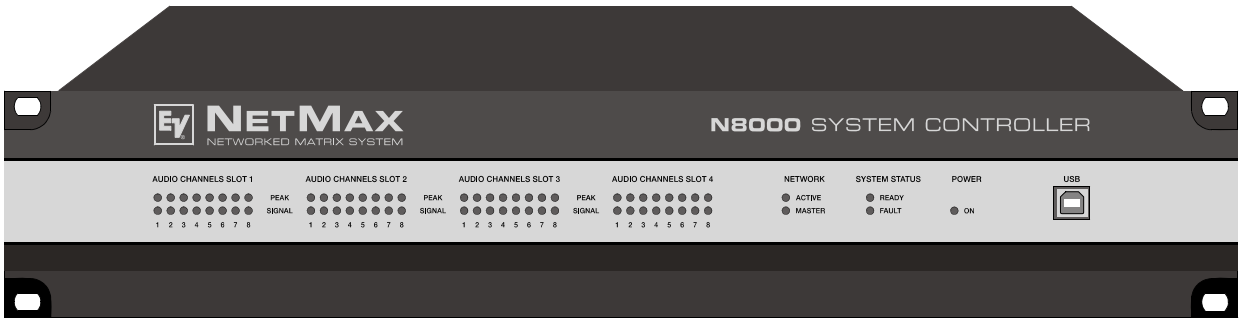
Electro-Voice®

OWNER'S MANUAL



NETMAX
NETWORKED MATRIX SYSTEM

N8000 SYSTEM CONTROLLER

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IMPORTANT SAFETY INSTRUCTIONS

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.
AVIS: RISQUÉ DE CHOC ELECTRIQUE. NE PAS OUVRIR.
WARNING: CONNECT ONLY TO MAINS SOCKET WITH PROTECTIVE EARTHING CONNECTION.

The lightning flash with arrowhead symbol, within an equilateral triangle is intended to alert the user to the presence of uninsulated “dangerous voltage“ within the product’s enclosure that may be of sufficent magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with a dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacture’s instructions.
8. Do not install near heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or the grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by the manufacturer.
12. Use only with the cart, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.

13. Unplug this apparatus during lightning storms or when unused for a long period of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. Do not expose this equipment to dripping or splashing and ensure that no objects filled with liquids, such as vases, are placed on the equipment.
16. To completely disconnect this equipment from the AC Mains, disconnect the power supply cord plug from the AC receptacle.
17. The mains plug of the power supply cord shall remain readily operable.

Management of WEEE (waste electrical and electronic equipment) (applicable in Member States of the European Union and other European countries with individual national policies on the management of WEEE) The symbol on the product or on its packaging indicates that this product may not be treated as regular household waste, but has to be disposed through returning it at a Telex dealer.

IMPORTANT SERVICE INSTRUCTIONS

CAUTION: These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

1. Security regulations as stated in the EN 60065 (VDE 0860 / IEC 65) and the CSA E65 - 94 have to be obeyed when servicing the appliance.
2. Use of a mains separator transformer is mandatory during maintenance while the appliance is opened, needs to be operated and is connected to the mains.
3. Switch off the power before retrofitting any extensions, changing the mains voltage or the output voltage.
4. The minimum distance between parts carrying mains voltage and any accessible metal piece (metal enclosure), respectively between the mains poles has to be 3 mm and needs to be minded at all times. The minimum distance between parts carrying mains voltage and any switches or breakers that are not connected to the mains (secondary parts) has to be 6 mm and needs to be minded at all times.
5. Replacing special components that are marked in the circuit diagram using the security symbol (Note) is only permissible when using original parts.
6. Altering the circuitry without prior consent or advice is not legitimate.
7. Any work security regulations that are applicable at the locations where the appliance is being serviced have to be strictly obeyed. This applies also to any regulations about the work place itself.
8. All instructions concerning the handling of MOS-circuits have to be observed.

NOTE: **SAFETY COMPONENT (MUST BE REPLACED BY ORIGINAL PART)**

HF-Interference

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection agains harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or televsion reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

DECLARATION OF CONFORMITY

Applicant: **Telex EVI Audio GmbH**
Hirschberger Ring 45
94315 Straubing
Germany

Type of Equipment: System Controller

Model Number: **N8000**

Serial Number: **1703230424010021**

Test Report Number: **266.242**

Test Report Is On File At: **EMV Testhaus GmbH**
Gustav-Hertz-Straße 35
94 315 Straubing
Germany

Deutscher Akkreditierungs Rat
DAR
Registration number: TTI-P-G 101/95-20

This device complies with Part 15 of the FCC Rules for Class B Devices.

Regulation: **United States Code of Federal Regulations 47**
Part 15-Digital Devices, Subpart B-Unintentional Radiators, Class B

Standard: **ANSI C63.4-2003 Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical Equipment in the Range of 9 kHz to 40 GHz.**

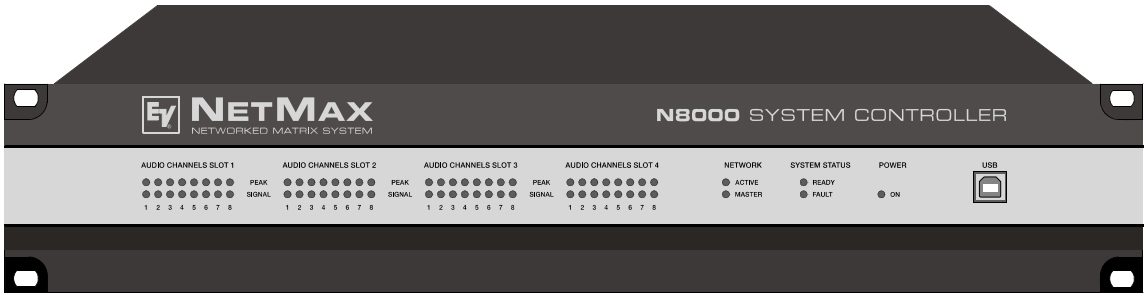
Limit: **DIN EN 55022:1999-05 Information Technology Equipment Radio Disturbance Characteristics – Limits and Methods of Measurement**

Verified by:

Date: Straubing, May 2nd, 2006

1 Introduction

First of all we want to express our thanks and offer our congratulations that you have selected the NetMax N8000 System Controller from Electro-Voice. Before operating the NetMax N8000 please read this instruction manual attentively to ensure that this device provides optimal performance and that damages due to improper use are avoided.



N8000 front view

1.1 Description of the system

NetMax is a modular, network-compatible and freely configurable audio system with which complete system solutions can be constructed. These system solutions exactly meet the customers' requirements. Applications are all kinds of professional audio installations, complex building sound reinforcement systems as well as concert sound applications. NetMax integrates all components ranging from the matrix to the speakers including system control and system monitoring in a common audio platform. The configuration, operation and monitoring of a NetMax system are effected by the PC Software IRIS-Net - Intelligent Remote & Integrated Supervision.

The central unit of NetMax is the N8000 system controller with up to 32 audio channels, mixer and matrix functions, signal processing and extensive control and monitoring functions. Several N8000 can be connected via a CobraNet™ audio and control network so that a large, decentralized audio system can be assembled.

NetMax also manages the Electro-Voice P-series remote amplifiers including its speaker and system monitoring functions. The connection is directly effected via CAN to the N8000.

A NetMax system meets all relevant safety requirements. All audio connections, interfaces and processor systems are monitored and displayed in case of fault. By using CobraNet™ redundant networks can be assembled.

1.2 N8000 features

NetMax N8000 is an all-purpose digital audio system controller with outstanding performance features. A high quality system design provides excellent audio quality and clear sound, which is achieved by the application of high-end 24 Bit A/D and D/A converters with 120 dB volume range, high-quality input and output circuits in the analog domain and digital signal processing with optimized 48 bit double-precision algorithms. Hence, the N8000 is even particularly suitable for demanding applications in theatres, concert halls, big churches etc.

NetMax N8000 is highly flexible due to the modular hardware design which renders many other applications possible. Four slots with 8-channel audio modules at the rear of the device offer up to 32 local audio channels. Each slot can be equipped either with an audio input module or an audio output module. So, various configurations (e.g. 8-in/8-out, 8-in/16-out, 8-in/24-out, 16-in/16-out, 24-in/8-out) can be realized in only one single device. In addition, N8000 can be equipped with a CobraNet™ network module. Therefore, several N8000 can be integrated in a network and be connected to a large, sophisticated system.

The signal processing in the N8000 is effected on powerful audio signal processors where, depending on the stage of expansion, up to 8 DSPs are available. The software contains a multitude of freely programmable signal processing components. Among other things, these are filters with all possible characteristics, parametric and graphic equalizer, crossover network, matrix router and matrix mixer, delays, dynamic functions, etc. Diverse configurations can be created by combining and connecting these DSP blocks. The programming is done via the PC software IRIS-Net. With that, you choose the desired components from a signal processing library, place them in a working area on the screen and wire them to a signal flow chart. Thus, the resulting DSP configuration has only to be transferred to the N8000 and is ready for immediately use.

The powerful signal processing allows complex configurations for the adjustment and control of the sound system, depending on the application or type of event. Thus, the sonic quality of PA speakers, monitor speakers, front fill systems as well as of the sound reinforcement of adjoining rooms, lobbies, areas for the staff etc. can be optimized and tuned individually. In other words, the N8000 copes with every application - even with large and complex systems - absolutely exactly and reliably.

In addition to the audio processing, the NetMax N8000 is equipped with diverse control functions. The scheduling with calendar function makes it possible to program one-time or recurring events. The recurrence can occur annually, monthly, weekly, daily, hourly or even within smaller time intervals. Furthermore, daily programs can be set up and can also be combined to weekly operations. With the event control, reactions to certain events or system states can be configured, e.g. in case of overstepping or undershooting of threshold values. Faults in the device or in the complete NetMax system are detected automatically and can be displayed on the PC screen or transmitted to external sites if necessary.

Faults and other events are recorded in an internal log file with date and time. Furthermore, it can be defined which types of errors or events should be recorded. The log can be read out and displayed on the screen at any time. In the NetMax N8000 individual functions can be integrated into complex operations. For example, several parameters can be set with various values or states in a scene and can be changed manually or automatically at any time.

The NetMax N8000 is equipped with all relevant interfaces by default in order to provide the connection to the network and external components. The Ethernet port makes the connection to existing building networks (intranet) and communication via the Internet possible. Ethernet is also the common connection between one or more N8000s and a PC with IRIS-Net software for the configuration, control and monitoring of a complete NetMax system. Two RS-232 serial ports can be used in order to control the N8000 from external multi-media systems, e.g. Crestron™ or AMX™. For that, an open interface protocol is available. The remote CAN-bus serves as connection to Electro-Voice remote amplifiers. Up to 100 amplifiers can be attached via CAN to one single N8000. Together with additional N8000s and amplifiers they can also be integrated in a complex and powerful audio system. The NetMax N8000 also has a control port which offers freely programmable control inputs and outputs. Switches, potentiometers or external control voltages can be connected to the control inputs (GPIs). Any logic and analog functions can be programmed. External elements which can be used to signal certain states can be attached to the control outputs (GPOs). A PC can be connected to the USB port on the front faceplate if the N8000 has been installed in a rack and the Ethernet port cannot be reached easily. Via the USB interface the network parameters of the N8000 can be edited and files containing the entire N8000 configuration can be transferred.

The highest standards regarding construction and mechanical working have been followed. The chassis is extremely robust and, therefore, effectively protects the electronics against outside influences. A temperature controlled fan provides thermal stability and also constant ambient conditions inside the device. All audio interfaces are electronically balanced and have Phoenix screw terminal connectors.

By reading this instruction manual you will get to know many additional features and functions of the NetMax N8000. Please read on attentively and keep this manual in order to be able to consult it at any time.

1.3 Unpacking and warranty

Please open the packaging and uncase the N8000. The following accessories are added to the device:

- N8000 owner’s manual (this document)
- Power supply cord
- 2 CAN terminating impedances
- 2 Phoenix connectors (6-pin)
- Warranty card

Please completely fill out the warranty card in the event that you need to make a warranty claim. We also ask you to keep the sales slip and the packaging together with the warrenty card in case the unit has to be returned.

1.4 Installation instruction

The N8000 has to be set up and installed so that both air supply and ventilation are ensured on both sides of the device. The direction of ventilation is from left to right when you look at the front faceplate. Devices with an opposing routing of air flow should not be installed in the same rack. When installing the N8000 in a rack, a free air duct between the sides of the N8000 and the side panel of the rack to the upper rack ventilation must be observed in order to ensure sufficient air ventilation. There must be at least 100 mm free space for ventilation above the rack.

ATTENTION:
The maximum ambient air temperature of +40°C should not be exceeded in order to ensure failure-free operation.

Standard installation rails should be used when mounting an N8000 in transport racks in order to prevent twisting of the front faceplate.

The N8000 must be protected against: dripping/splashing water, direct solar radiation, high ambient air temperature or direct impact of heat sources, high moisture, heavy vibrations and dust deposit.

If these conditions cannot be ensured permanently, maintenance is obligatory at regular intervals in order to prevent any breakdowns which are mainly due to negative environmental influences.

If the N8000 is transported from a cold to a warm environment, moisture may condense at the core. The device should not be started up before warming to the changed temperature (approx. after 1 hour). If a solid or liquid is in the housing, cut the device off from the mains power at once and have the device checked by an authorized service center before re-using it.

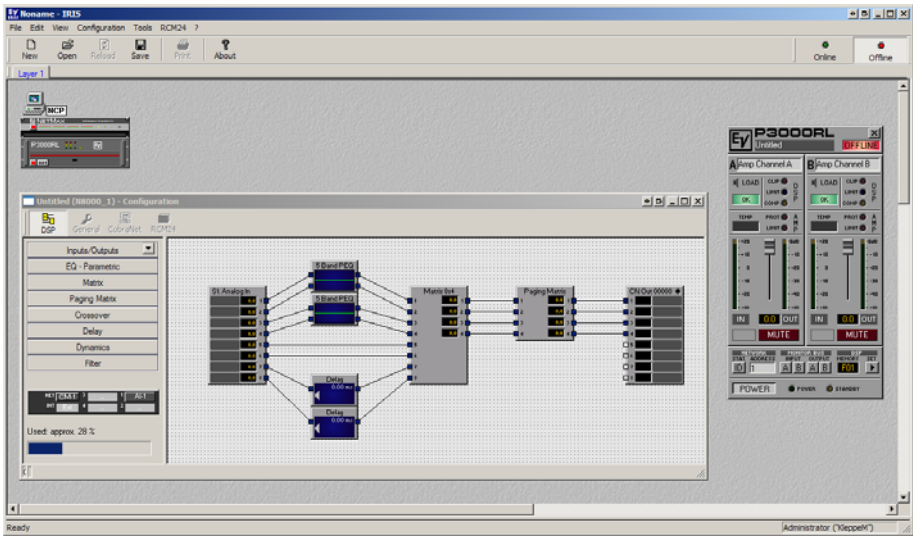
1.5 IRIS-Net

The IRIS-Net (Intelligent Remote & Integrated Supervision) PC software is used to configure and operate the N8000 system controller. The configuration of the N8000 can be done offline (i.e. without connection between the PC and the N8000) on the PC. After the connection between the PC and the N8000 has been established via Ethernet, the configuration can be transmitted to it. In addition to configurations, IRIS-Net can also be used for extensive supervision, control and monitoring of N8000 system controllers (and Electro-Voice Precision Series Remote Amplifiers which are connected to them).

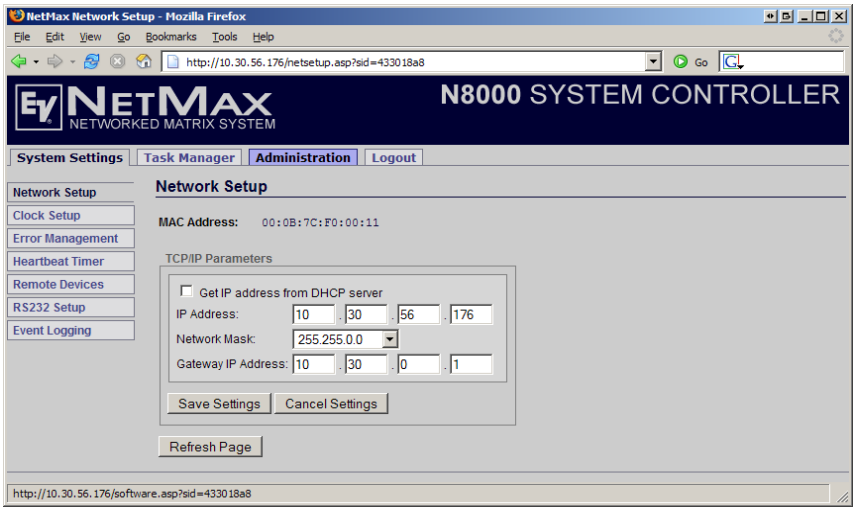
Please see the short IRIS-Net instruction in the menu: ? > Quick Start Guide ... .

1.6 Browser Interface

Some of the configuration and operation options of the N8000 which are available in IRIS-Net are also provided by the N8000 browser interface. Any standard Internet browser with activated JavaScript and CSS can be utilized in order to use the browser interface. Please find the detailed information on the N8000 browser interface in the file N8000 browser manual in the IRIS-Net setup directory (\Documentation\NetMax).



IRIS-Net (Intelligent Remote & Integrated Supervision)

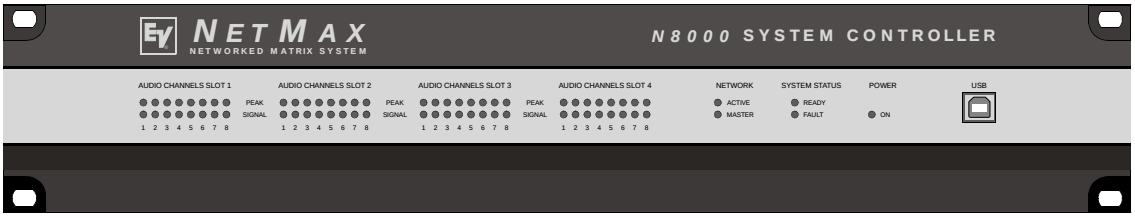


N8000 Browser Interface

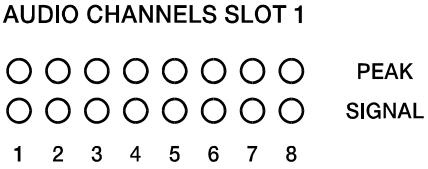
2 Control Elements and Connections

2.1 Front Faceplate

The front faceplate of the N8000 has level and status displays and it offers also the possibility to connect a PC via a USB interface. SIGNAL / PEAK-LEDs exist for all 32 audio channels. The channels are combined to groups of 8 and assigned to the audio-slots 1 to 4 at the rear. Additional LEDs inform about the states of the network, system and device and give a quick overview of whether the system is working faultlessly or if a problem has occurred.

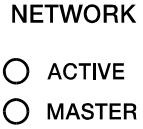


SIGNAL / PEAK-LEDs



These LEDs serve as level meter display for input and output signals. The SIGNAL-LED begins to flash at -25 dBU and indicates if a signal generally exists at the input or at the output. The PEAK-LED flashes when the N8000 is operated close to the level meter's limit. The limit is approx. at +18 dBU. The maximum level meters is +21 dBu so that there is 3 dB of head room until the final clip limit is reached. The PEAK-LEDs should only flare up sporadically in case of dynamic peaks. If the PEAK-LED of an input flashes constantly or very often, you should reduce the corresponding input signal slightly. If the PEAK-LED of an output flashes constantly, the internal gain should be reduced or else the connected device will be permanently overdriven.

NETWORK-LEDs



If the N8000 is operated on an audio network, e.g. CobraNet™, these LEDs show the status of the network. The ACTIVE-LED flashes or twinkles when audio data is sent or received via the network. If the LED is off, no communication via the audio network is taking place. The MASTER-LED is on when the N8000 serves as clock-master - in case of CobraNet™ it is also named the conductor. There is always only one master in an audio network, i.e. the MASTER-LED will only be illuminated on one N8000 within the network. If the unit currently functioning as

clock master breaks down or is removed from the network, another N8000 will take over this function automatically.

SYSTEM STATUS-LEDs

SYSTEM STATUS

READY

FAULT

These LEDs indicate device or system states. The READY-LED is on when the device has booted after switch-on and when it is ready for operation. An illuminated FAULT-LED indicates an internal error in the N8000 or an error in the NetMax system. During the configuration of the N8000, it can be specified which errors should be displayed. If the FAULT display is on, the error should be identified promptly. This can be done using the detailed diagnostics within the IRIS-Net PC software. The source of the fault has to be remedied immediately.

POWER-LED

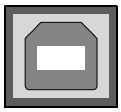
POWER

ON

This LED is permanently green when the N8000 is powered on. If the ON indication is not illuminated, even though the device is switched on, this device may not be connected to the power supply system or the primary fuse may be faulty.

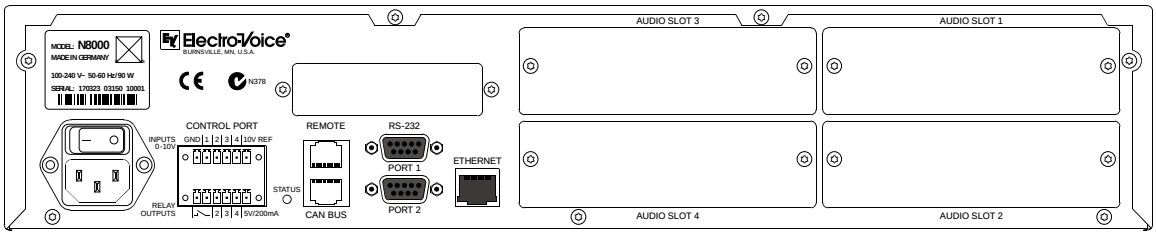
USB Interface

USB



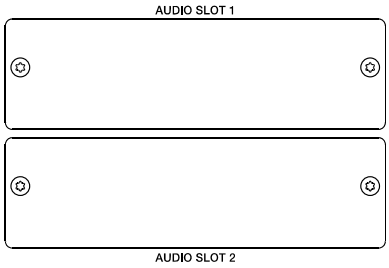
A PC can be connected at the front panel via the USB interface. Thus, it is possible to connect the N8000 with a PC even it is already installed - i.e. when the Ethernet interface at the rear panel is perhaps no longer accessible. Via the USB interface the network parameters of the N8000 can be edited and files containing the entire N8000 configuration can be transferred. You can find the necessary USB driver in the subdirectory \Driver\USB in the IRIS-Net setup directory. Please see chapter *Interface description* for more information on technical details concerning the USB interface and the other interfaces of the N8000 which are described in the following section.

2.2 Rear Panel



There are all connections for analog and digital audio signals, control interfaces and the power supply at the rear panel of the N8000.

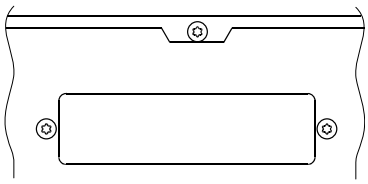
AUDIO SLOTs



The AUDIO SLOTs 1 - 4 are module slots for the installation of NetMax audio modules. There are both analog and digital input and output modules available. Also, a module for microphone input sensitivity is optionally available. Each slot can accept any module so you can equip those inputs and outputs which you need for your specific application. The N8000 detects the type of the module automatically and offers the corresponding configuration possibilities.

ATTENTION:
The N8000 has to be switched off if you want to change or install a module. You will find detailed instructions in the data sheet of the corresponding module.

Network Module Slot

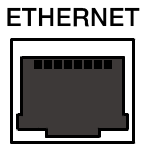


This slot is provided for the installation of a network module, e.g. CM-1 CobraNet™ module. There are all 64 audio channels - 32 inputs and 32 outputs - internally available at this slot. The CM-1 allows up to 32 digital audio input signals and 32 digital audio output signals to be transmitted via a CobraNet™ network simultaneously. Thus, several N8000 NetMax system controllers can be connected to create a large, distributed audio system. The

N8000 automatically detects an installed network module. The module can be configured in the PC software IRIS-Net.

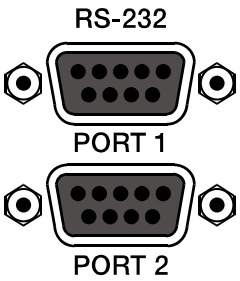
ATTENTION:
The N8000 has to be switched off if you want to change or install a module. You will find detailed instructions in the data sheet of the corresponding module.

ETHERNET Interface



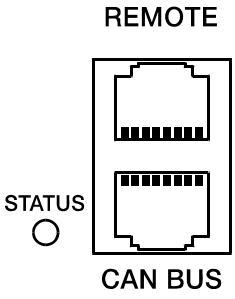
A computer and/or other N8000 devices can be connected via the Ethernet interface for 100Base-TX / 10Base-T Ethernet networks. Normally this connection is established via a standard (straight throug) Ethernet cable and an Ethernet hub or a switch. If the N8000 is to be connected directly with a computer or another N8000, a crossed Ethernet cable (crossover cable) must be used.

RS-232 Interfaces



The N8000 can be connected to external devices, such as multimedia system (AMX™, Crestron™) or facility management systems via the two RS-232 interfaces. All N8000 functions and parameters can be controlled and monitored via RS-232. Communication is done using an ASCII parser which is easy to implement. Thus, a NetMax system can be easily combined with media and touch panel control systems. A PC can also be connected to the RS-232 port to access N8000 parameters using a terminal program like Hyperterminal. A special instruction set is available in order to establish a connection to a PROMATRIX/PROANNOUNCE system. The two RS-232 ports can be configured according to their corresponding application via the IRIS-Net PC software.

REMOTE CAN BUS

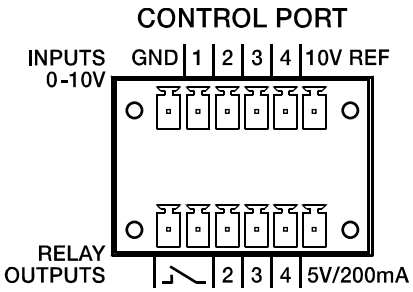


Electro-Voice remote amplifiers and other devices with CAN interfaces can be connected to the N8000 via the CAN interface. Up to 100 remote amplifiers can be connected with a single N8000. All connected components are linked to the NetMax monitoring and control platform.

The STATUS-LED is provided to monitor the communication on the CAN bus. If the CAN interface is not in use, the LED is deactivated. In normal mode the LED flashes every 2

seconds. The duration of the flashing within these 2 seconds depends on the bus load. The higher the bus load is the longer the duration of the flashing within these two seconds will be.

CONTROL PORT

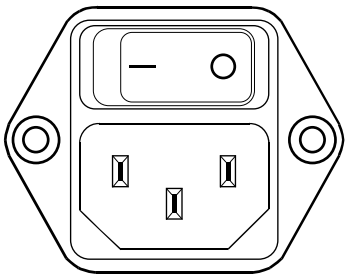


The CONTROL PORT contains four freely programmable control inputs, three freely programmable control outputs, one ready/fault output as well as reference connections for ground, +5 V and +10 V.

The control inputs IN1 - IN4 are DC inputs, which internally are connected to ground via pull-down resistors. From external sources voltages between 0 V and +10 V are possible. Either switch-mode functions or variable functions can be programmed for the control input via the IRIS-Net PC software. Examples of use are: power on/standby switching, preset switching or parameter control.

The control outputs OUT2 - OUT4 are relay contacts, which are open circuits in off-state (off). When the output is in on-state (on) the outputs are connected to ground. The outputs are able to signal internal states and they can directly operate LEDs, indicator lights or relays. The +5 V reference voltage is able to energize the externally connected elements with up to 200 mA. Operating states (critical temperature, overstepping or falling below of defined limit values, faults, etc.) can be relayed to central operation stations or other systems (fire alarm systems, life safety systems) even without use of a PC via the control outputs. You will find detailed information regarding configuration of the control ports in the IRIS-Net documentation.

Mains Connector and Power Switch



Please use the enclosed power cable in order to connect NetMax N8000 to the mains power supply. The N8000 is compatible with a supply voltage between 100 V AC and 240 V AC. Therefore, a supply voltage switch is not necessary. Internally, there is a mains fuse which is normally only blown in case of a fault. The fuse should only be replaced with an equivalent fuse with identical values for current, voltage and actuating characteristics by an authorized service center.

The N8000 can be switched on and off with the power switch on the rear of the device. The ON-LED on the front panel is immediately illuminated after switch-on. The N8000 boots and initializes all parameters with those values that had been previously active. The initialization takes some seconds. As soon as N8000 is ready for operation, the READY-LED is also illuminated.

3 Preparations

3.1 Mounting

1. **Install the expansion cards.**
   If you have purchased expansion cards (AI-1, AO-1, CM-1, DSP-1, etc.) for your N8000 system controller, please install them. In this regard, please note the paragraph page 15 as well as the installation instructions in the manuals which are enclosed to the expansion cards.

2. **Connect the power cable.**
   Please pay attention that the power switch of the N8000 (above the mains connector) is off.

3. **Install the program IRIS-Net (Intelligent Remote & Integrated Supervision) on your PC.**
   Please see the installation instruction for IRIS-Net in the file iris_readme.htm.

4. **If you have installed expansion cards with inputs or outputs (AI-1, AO-1 or CM-1) in step 1, connect the corresponding devices now.**
   Please note the instruction manual both of the expansion cards and the used devices.

5. **Connect the Ethernet interface of the N8000 with the PC via an appropriate Ethernet cable.**
   Please see the corresponding chapter *Ethernet Interface* on page 17.

6. **If your application also utilizes Electro Voice P-series Remote Control amplifiers, connect the CAN interface of the N8000 with the amplifiers.**
   Please see the corresponding chapter *CAN Interface* on page 18.

7. **Switch on the N8000 (via the power switch at the rear), the computer and any additional connected devices, if used.**
   In order to avoid any pops or thumps that may damage your speakers, please switch on the connected devices (if used) in the following order: audio signal sources - mixer and/or recorders - (power) amplifiers. These devices should be switched off in the reverse order.

8. **Now start the IRIS-Net program on your PC.**
   You will find a program introduction in the online help of IRIS-Net and the corresponding quick start guide in the menu: ? > Quick Start Guide ... .

3.2 Installation of expansion cards

The options for expanding the N8000 controller through the use of expansion cards are explained in this chapter. The N8000 can be equipped with expansion cards in different ways:

- 4 Slots (module slots) for the expansion of the system with analog/digital inputs (AI-1, MI-1, DI-1) or outputs (AO-1)
- 1 network module slot for the installation of a network module, e.g. CM-1 CobraNet™ Module

- 1 DSP expansion module (DSP-1) for the expansion of the storage capacity and signal processing

ATTENTION:
It is essential to switch off the N8000 if you want to install or change a module. You will find detailed instructions in the data sheet of the corresponding module.

System expansion with analog/digital inputs or outputs

There are four slots at the rear of the N8000 which are intended to expand the systems with analogue or digital inputs or outputs. These slots have the marking AUDIO SLOT 1 to AUDIO SLOT 4 (see the figure on page 12). Any combination of the following types of expansion cards can be installed:

- AI-1 with 8 analog inputs
- MI-1 with 8 microphone inputs
- DI-1 with 8 digital inputs
- AO-1 with 8 analog outputs

You can choose any slot for the installation of the expansion cards as the slot is automatically detected by the N8000 after the installation.

System expansion with a network module

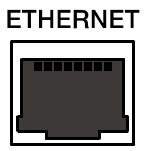
An audio network interface for CobraNet™ can be installed in the network module slot on the rear panel of the N8000. The CM-1 module that is used for this purpose has two Ethernet connections (Primary and Secondary) so a redundant network can be established. Up to 32 digital audio input signals and 32 digital audio output signals can be transmitted simultaneously.

Expansion of the DSP performance of the system

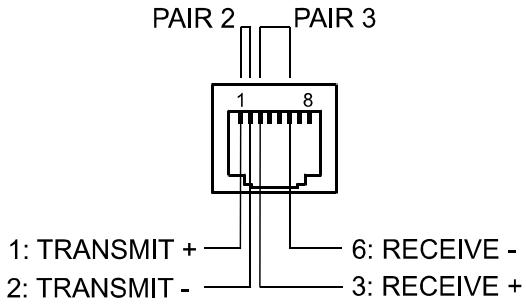
The N8000 system controller has efficient DSP modules with a total computing power of 300 MIPS and a working memory for a maximum delay of 21.8 seconds. If this does not meet the requirements of your application, the processing power as well as the working memory of the N8000 can be increased by installing the DSP-1 NetMax DSP expansion module. This allows the execution of more complex DSP programs and the use of longer delay times or additional delay lines.

3.3 Interface description

Ethernet Interface



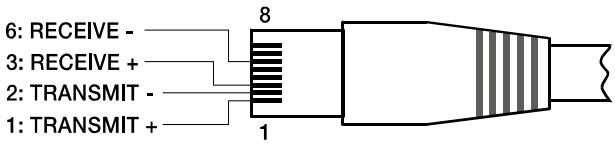
By connecting the N8000 system controller via the Ethernet interface, the communication between the N8000 and one or several PC is possible. This allows the configuration of N8000 via IRIS-Net software. Furthermore, the whole connected system (consisting of N8000s and EV Precision Series Remote Control Amplifiers) can be operated and monitored. By using appropriate network hardware it is even possible to operate the N8000 via a wireless network (WLAN). The Ethernet interface on the rear of N8000 is a RJ-45 connector (8P8C). Both 10Base-T and 100Base-TX Ethernet standards are supported. The connections of the Ethernet interfaces can be seen in the following figure and table.



Pin Assignment of Ethernet jack

Pin	Name	Description	Pair	Colour	
				T568A	T568B
1	Tx+	Transmit+	2	Green striped	Orange striped
2	Tx-	Transmit-		Green	Orange
3	Rx+	Receive+	3	Orange striped	Green striped
6	Rx-	Receive-		Orange	Green

The pin assignment of the Ethernet connector is shown in the following figure. The connector is viewed from the contact side.



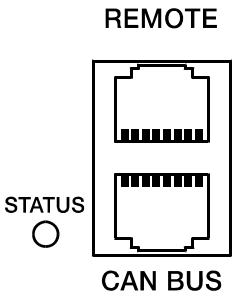
Pin Assignment of Ethernet plug

The maximum length of a connected cable segment is 100 meters in both Ethernet standards, in which two twisted pairs are used in one cable. Category 3 (unshielded CAT-3) can be used for 10Base-T communication. Category 5 (CAT-5) must be used for 100Base-TX. Cat-5 cable is compatible with 10Base-T as well.

If the N8000 is connected via a patch cable to a hub/switch, the wiring of the cable at pin 1 of the first connector has to be connected with Pin 1 of the other connector; this is the same regarding the other pins as well. There are the T568A and T568B standards for the colors of the different wires used. However, T568B standard is more widely-used.

If a crossover cable is used in order to connect a N8000 with a PC directly, pair 2 has to be interchanged with pair 3 on one side of the crossover cable. Thus, the necessary swap of the sending and receiving lines that is internally processed in a hub/switch takes place.

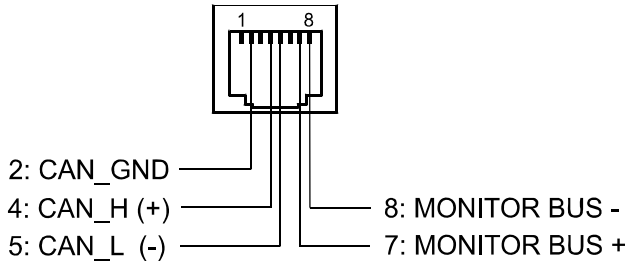
CAN Interface



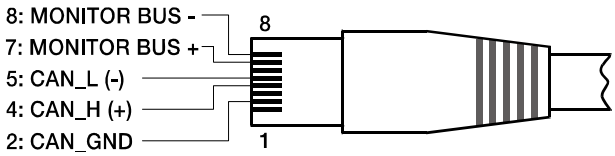
The network for the Electro-Voice remote power amplifiers is based on the CAN-bus standard, which has become widely accepted in the automotive, industrial and security sector and which has proved itself for years. The CAN-bus is a balanced serial interface to transmit commands and data. 100 power amplifiers or other devices up to a maximum cable length of 1000 meters can be connected per CAN-bus.

Each bus member has 2 RJ-45 connectors for the remote CAN-bus. The connectors are connected in parallel and serve as input or output (for a loop-through) of the remote network. The CAN-bus has to be terminated with a 120 Ω terminating resistance at both ends. Therefore, two terminating connectors CAN-TERM 120 Ω are included with the N8000. Please plug these terminating connectors in the free RJ-45 connectors of the first and the last device at the CAN-bus.

In addition to the CAN-bus, a balanced audio monitor signal is carried in the network wiring in order to monitor the input and output signals of all remote networks. This monitor bus makes it possible to monitor the input and output signals of all power amplifiers existing in the remote network via the software without the need for additional wiring work. At the N8000, the monitor bus can be gripped at a CAN connector (pins 7 and 8), it can be connected with an audio input and routed to a monitor box (e.g.) for monitoring purposes.



Pin Assignment of CAN jack



Assignment of CAN plug

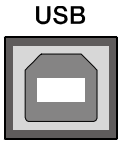
Pin	Name	Colour	
		T568A	T568B
2	CAN_GND	Green	Orange
4	CAN_H (+)	Blue	
5	CAN_L (-)	Blue striped	
7	MONITOR BUS +	Brown striped	
8	MONITOR BUS -	Brown	

The CAN-bus makes it possible to use different data transmission rates, in which the boud rate is indirectly proportional to the length of the bus. If the network is only slightly extended, higher baud rates up to 500 kbit/s are possible. In case of larger extensions, the baud rate has to be lowered (to a min. transmission rate of 10 kbit/s). The following table explains the relationship between baud rate and length of the bus or extension of the network. In principle, bus lengths over 1000 meters should only be realized with repeaters.

Transfer rate (in kbit/s)	Bus length (in m)
500	100
250	250
125	500
62,5	1000
20	2500
10	5000

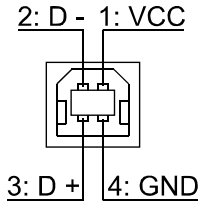
Please see the *CAN bus principles* chapter on page 36 in the appendix of this document as well as the instruction manuals of the connected devices for further information on CAN bus (especially on system examples and performance specifications).

USB connection



The USB interface on the front panel of the N8000 uses the USB 1.1 standard. Accordingly, the low speed (1,5 MBit/s) and full speed (12 MBit/s) transfer rates are supported. According to USB specifications, the cable which is connected to this interface must not be longer than 5 meters. The USB interface of the N8000 is a USB-B (female) connector.

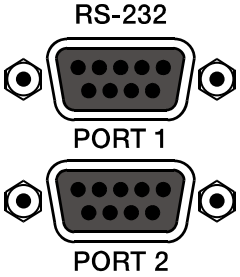
The standard pin configuration can be seen in the following figure and table.



Pin Assignment of USB jack

Pin	Name	Description
1	VCC	+5 V
2	D-	Data -
3	D+	Data +
4	GND	Ground

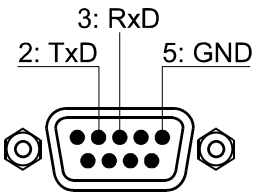
RS-232 Interface



With the RS-232 interface on the rear panel, communication with the N8000 is possible via a simple ASCII communication protocol. Thus, the N8000 can be operated and configured via external devices (examples are, among other things, media control systems and PROMATRIX/ PROANNOUNCE DPM4000). In order to make data transfer between the N8000 and the connected device possible, the interfaces on both sides of the transmission route must be identically configured. The configuration of the interface of the N8000 is given in the following table.

Parameter	Value
Data bit	8
Parity bit	-
Stop bit	1
Transfer rate	19200 bit/s

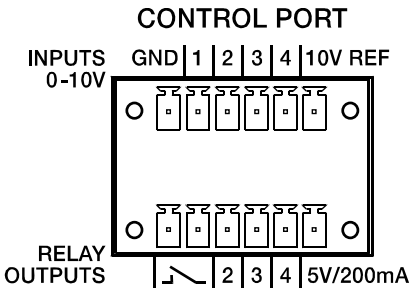
The pins of the RS-232 interface used in the N8000 are indicated in the following illustration and table. Connections which are not given are internally connected in the N8000 so that the communication between the N8000 and the connected device is possible via a software handshake system. The cable which is used for the connection should not be longer than 15 meters.



Assignment of RS-232 jack

Pin	Name	Description	Input/Output (view from N8000)
2	TxD	Transmit	Out
3	RxD	Receive	In
5	GND	Signal Ground	-

CONTROL PORT



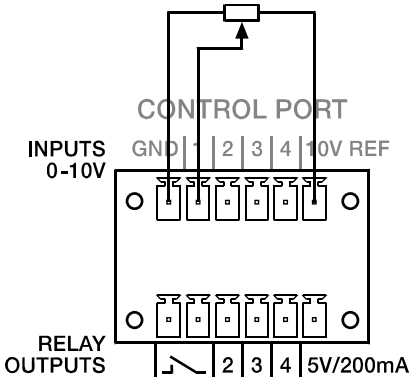
The control port on the rear of N8000 is divided into two parts. Two Phoenix connectors (6-pin) are included in delivery in order to be able to connect external components.

Control Inputs

The upper part, which is marked as INPUTS 0-10V on the device, provides four freely programmable control inputs for voltages between 0 volt and 10 volts. The inputs are numbered in order from 1 to 4. The N8000 provides its own voltage supply for externaly connected monitoring elements, e.g. potentiometers or switches. The voltage supply is available at the 10V REF and GND connectors of the control port.

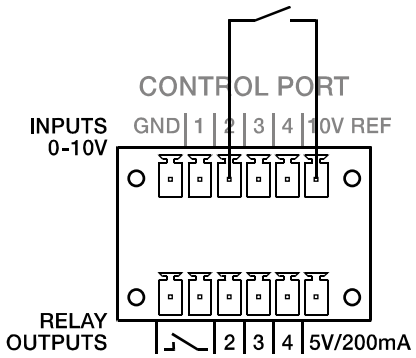
ATTENTION:
The maximum allowable current at the 10 V REF is 100 mA.

The following figure shows an example application for the "analogue circuit" on the control inputs of the N8000. A voltage which can be changed via a potentiometer is connected at the control input 1. The N8000 can be configured via IRIS-Net so that this voltage can be used to adjust a variable parameter, for example, adjusting the volume of an audio input or output.



Control port with potentiometer

An example for a "digital circuit" on a control input of N8000 is shown in the following figure. The control input 2 is connected to ground via a switch (normally open contact). In IRIS-Net the N8000 can be so configured that, for example, an audio input or output channel can be muted by operating a switch. The threshold voltage for high/low which are used for this purpose are freely configurable for any input.



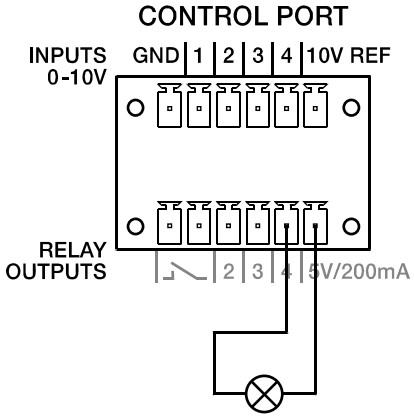
Control port with switch

Control Outputs

The lower part of the control port, which is marked as RELAY OUTPUTS on the N8000, provides different outputs. There are three freely programmable control outputs which are numbered in order from 2 to 4. These control outputs are designed as relays contacts (normally open), i.e. they are open when they are inactive (off) and closed towards ground when they are active (on). A voltage source at the 5V/200mA connection is available in order to operate the externally connected elements.

ATTENTION:
The maximum allowable current at the 5 V output is 200 mA.

The two left connections of the RELAY OUTPUTS are the READY/FAULT output of the N8000. This floating output is closed when the N8000 is ready for operation and no error has occurred. It is possible in IRIS-Net to configure which kind of error causes the contact to be opened. Due to this feature, this contact is especially suitable for the integration of the N8000 in life safety systems (closed current principle). An example application for the circuit of a control output is shown in the following figure. An operating state of the N8000 (e.g. the overstepping of a temperature limit) is indicated via a pilot light.

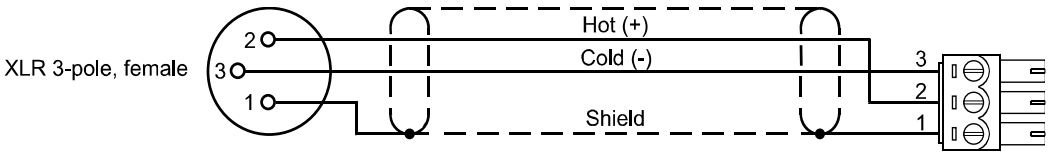


Control port with pilot light

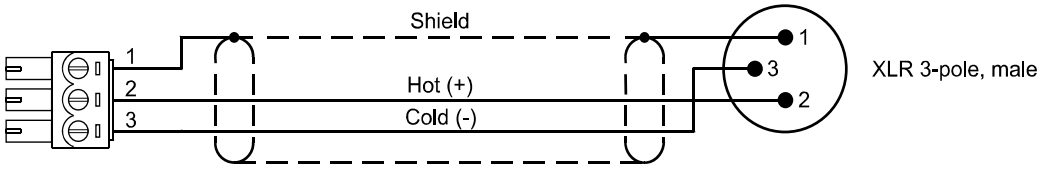
Audio Interfaces

Analog audio connecting cable

It is advisable to choose balanced cables (2 signal conductors + shield) with XLR connectors as analog audio connections. Although all N8000 analog audio inputs and outputs can be used unbalanced, balanced audio cable is the better choice. A balanced differential audio circuit can prevent the injection of external noise into the audio path and is strongly recommended, particularly for long cable runs.



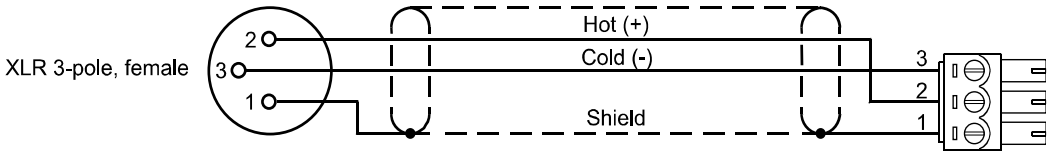
N8000 Analog audio input cable, XLR (female) on Phoenix



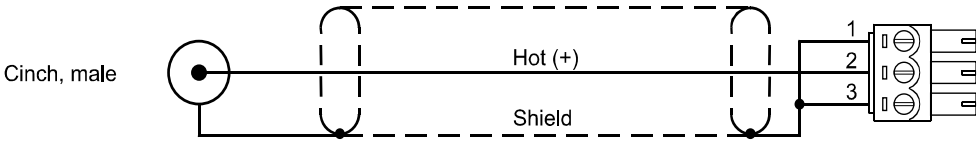
N8000 Analog audio output cable, XLR (male) on Phoenix

Digital audio connecting cable

It is advisable to choose balanced cables (2 signal conductors + shield) with XLR connectors as digital audio connections. Although all N8000 digital audio inputs can be used unbalanced, balanced audio cable is the better choice.



N8000 Digital (balanced) audio input cable, XLR (female) on Phoenix



N8000 Digital (unbalanced) audio input cable, Cinch (male) on Phoenix

4 Network configuration

4.1 Introduction

The N8000 system controller can be connected to a TCP/IP-network via the Ethernet interface at its rear panel (see page 13). For further information on the principles of Ethernet and TCP/IP please see the chapter *Ethernet principles* on page 33 in the appendix of this document.

The N8000 comes with the following network configurations from the factory:

Parameter	Value
IP address	192.168.1.100
Subnet mask	255.255.255.0
Gateway	192.168.1.1
DHCP	deactivated

An IP address must be unique, it must only be allocated to one single device (host) in a network. In case a new Ethernet network is designed for the operation of the N8000, it is recommended to retain the subnet mask and network ID which had been set at the factory. If the N8000 is integrated in an existing Ethernet network, the network configuration of the N8000 must be adapted.

The preset IP address of the N8000 can be retained if and only if

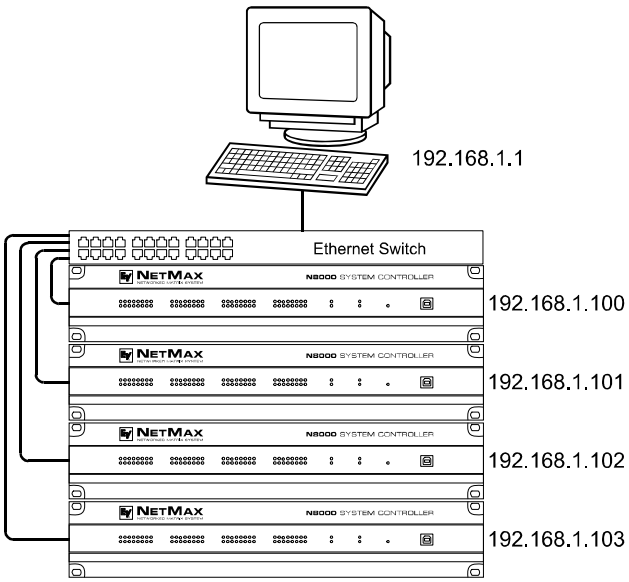
- only a single N8000 with factory-set configuration is connected via Ethernet and
- the network ID 192.168.1 can be retained and
- no other devices have the Host-ID 100.

If at least one of these three conditions is not fulfilled, the preset IP address of the N8000 has to be changed.

Example:

The following illustration shows an example application with four NetMax N8000 in a closed network. These are networked with a PC via a central Ethernet switch. Thus, the factory preset

IP address 192.168.1.100 would exist four times in the network. Because of this, the preset IP address of three NetMax N8000s must be replaced with a unique address.



Example of an Ethernet network with four N8000

It is advantageous and strongly recommended to list all devices used in the Ethernet network and IP addresses for changing the preset IP addresses of the N8000s. An example of such a list for the example system shown in the above illustration is given in the following. You will find an empty form in the appendix. Please enter the description of the device, an unambiguous description and the IP address which has to be assigned to the device for every device used in the network in this list. If the device is displayed in IRIS-Net, you can also use the description that is used there.

Device	IRIS-Net Device Name	Location/Description	IP-Adresse
N8000	main office	main office	192.168.1.100
PC	-	main office	192.168.1.1
N8000	administration	administration building	192.168.1.101
N8000	production	production building	192.168.1.102
N8000	multi-purpose	mult-purpose hall	192.168.1.103

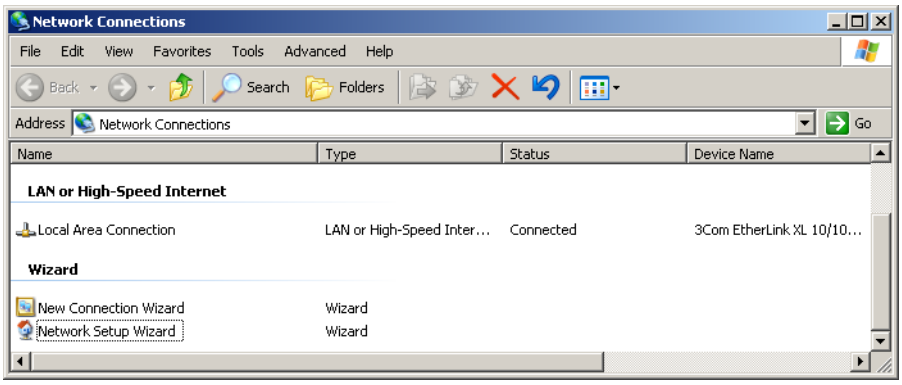
When the example system is put into operation, the IP addresses which are given in the overview table, should be assigned to each device. The assignment of the IP address can be made via IRIS-Net and via the N8000 browser interface. In IRIS-Net the assignment is possible both over the USB interface and the Ethernet interface of the N8000. Information about the exact proceedings are given in the IRIS-Net online-help. For the assignment of the IP address over the N8000 browser interface open the browser interface using the current (preset) IP address of the N8000. Information about the exact proceedings are given in the N8000 browser manual.

4.2 Configuration

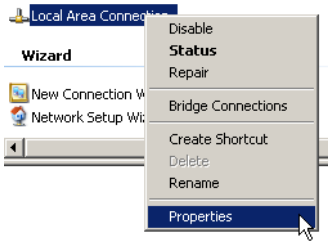
Configuration and testing of an Ethernet connection with N8000

The purpose of this procedure is to build a connection between a PC and a N8000 with factory network settings (see page 25) via Ethernet and to check the proper function of this connection. In the following it is assumed that neither the PC nor the N8000 are connected with an existing network.

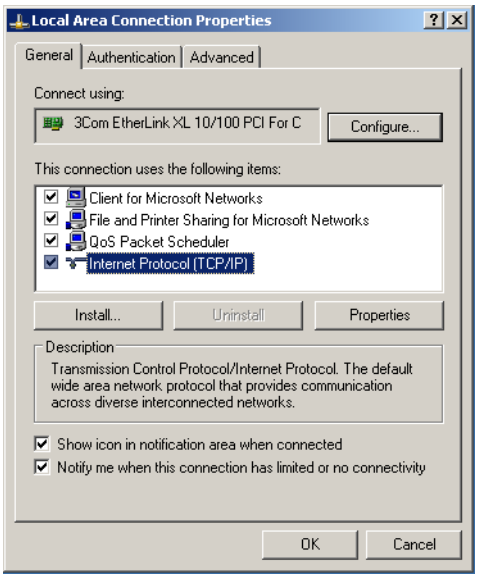
1. **Click on *Start > Control Panel > Network Connection*.**
   The window *Network Connections* appears. Here, all available possibilities for the connection of your PC with a network are given. The Ethernet connection that is used for the connection with the N8000 is contained in the *LAN or High-Speed Internet* category.


Network Connections
File Edit View Favorites Tools Advanced Help
Back Search Folders
Address Network Connections
Go
Name Type Status Device Name
LAN or High-Speed Internet
Local Area Connection LAN or High-Speed Inter... Connected 3Com EtherLink XL 10/10...
Wizard
New Connection Wizard Wizard
Network Setup Wizard Wizard

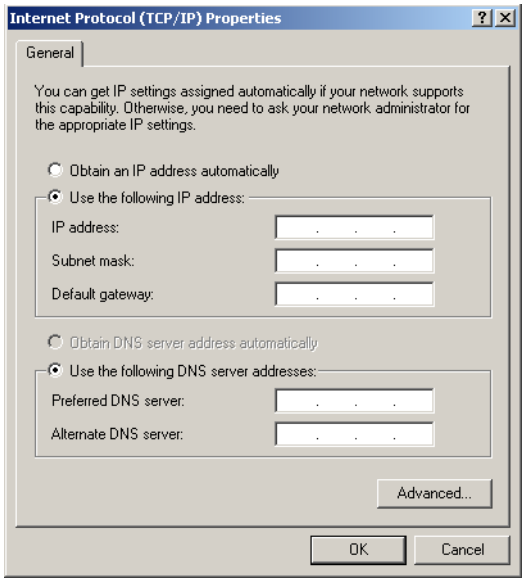
2. **Click on (with the right mouse button) that particular Ethernet connection in the N*etwork Connections* window that should be used for the connection with the N8000.**
   The context menu of the chosen Ethernet connection appears.



3. **Click on *Properties* in the context menu.**
   The pop-up window *Local Area Connection Properties* appears.



4. **Double click on I*nternet Protocol (TCP/IP)*.**
   The pop-up window *Internet Protocol (TCP/IP) Properties* appears.

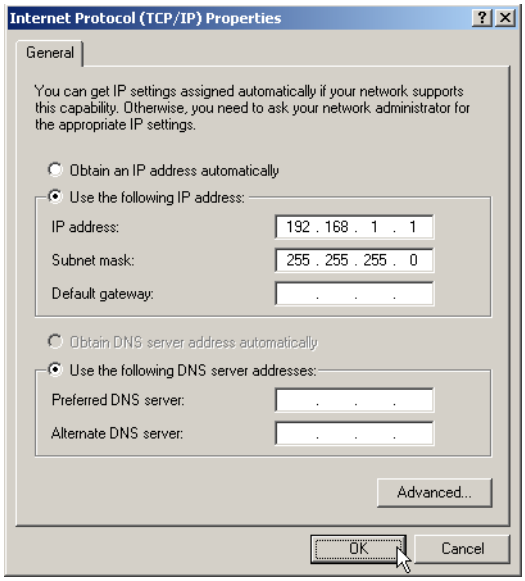

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
Subnet mask:
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

5. **Choose the option *Use the following IP address* in the window.**

6. **Type 192.168.1.1 in the *IP address* input field.**

7. **Type 255.255.255.0 in the S*ubnet mask* input field.**

8. **Close the window *Internet Protocol (TCP/IP) Properties* by clicking on the *OK* button.**


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 1 . 1
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

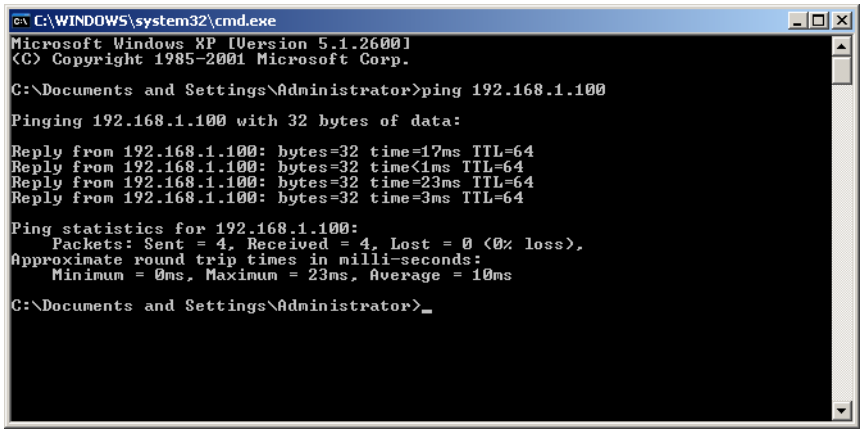
The IP configuration of the PC is now complete. In the following steps the connection of the PC with the N8000 will be established and checked.

9. **Connect the network connection of your PC to the Ethernet interface of the N8000 directly with a crossover cable, or with a patch cable and a hub/switch.**
   Please see the *Ethernet principles* chapter on page 33 in the appendix of this document for more information on the details of connecting devices via Ethernet.

10. **Connect the N8000 to the power supply system and switch it on by operating the power switch on the rear.**
    The green ON-LED (see page 11) on the front panel of the N8000 is illuminated. After some seconds the green READY-LED (see page 11) is also illuminated and signals the successful start activity of the N8000.

11. **Click on *Start* > *All Programs* > *Accessories* > Command Prompt.**
    The window *command prompt* appears.

12. Enter *ping 192.168.1.100* and tap the return button.


C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\Administrator>ping 192.168.1.100
Pinging 192.168.1.100 with 32 bytes of data:
Reply from 192.168.1.100: bytes=32 time=17ms TTL=64
Reply from 192.168.1.100: bytes=32 time<1ms TTL=64
Reply from 192.168.1.100: bytes=32 time=23ms TTL=64
Reply from 192.168.1.100: bytes=32 time=3ms TTL=64
Ping statistics for 192.168.1.100:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 23ms, Average = 10ms
C:\Documents and Settings\Administrator>

The PC is now checking the connection with the N8000. For this four network packets are sent to the N8000 via Ethernet then the N8000 has to confirm these packets. If the Ethernet connection is successful, no packets get lost. Therefore, 0% loss is stated in the ping statistics.

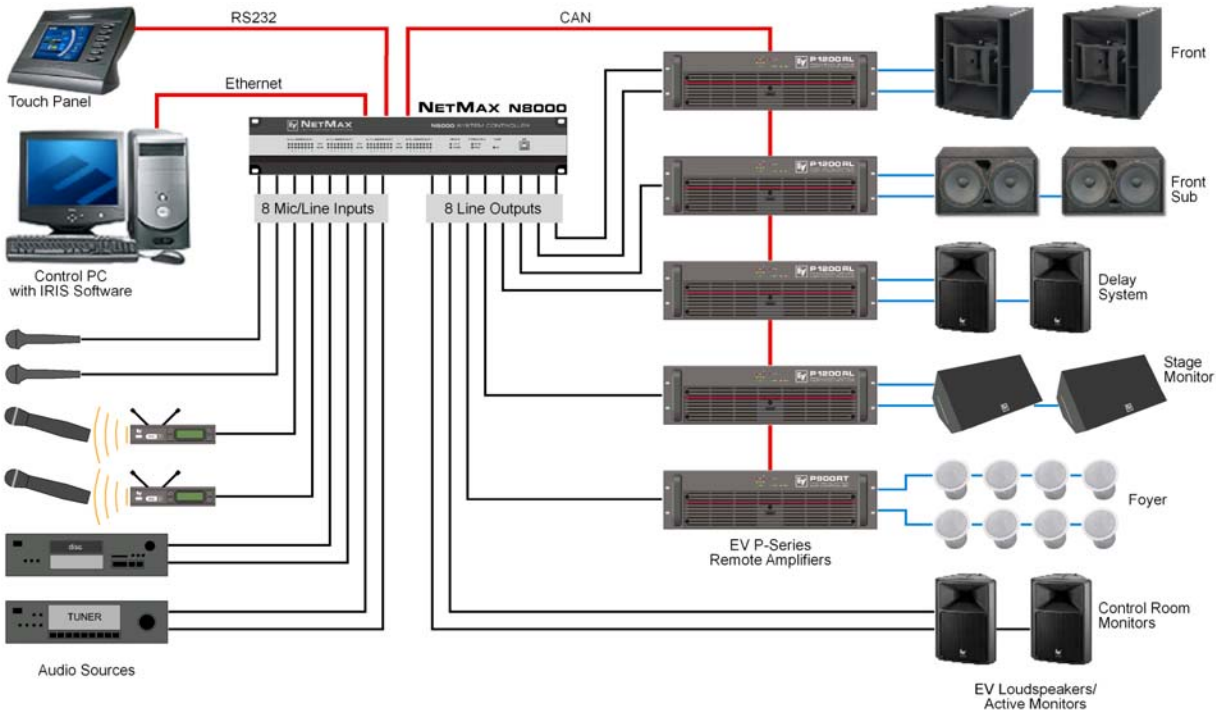
5 Appendix

5.1 Application Example

Installation in a multi-purpose hall

The following figure shows an example for the application of a N8000 system controller in a multi-purpose hall. Four microphones, one CD player and one tuner are the connected signal sources. Both active and passive speakers are used for the sound reinforcement. The Electro-Voice Precision Series Remote Amplifiers which are used for the operation of the passive speakers are connected with the N8000 via the CAN Bus in addition to the audio connections.

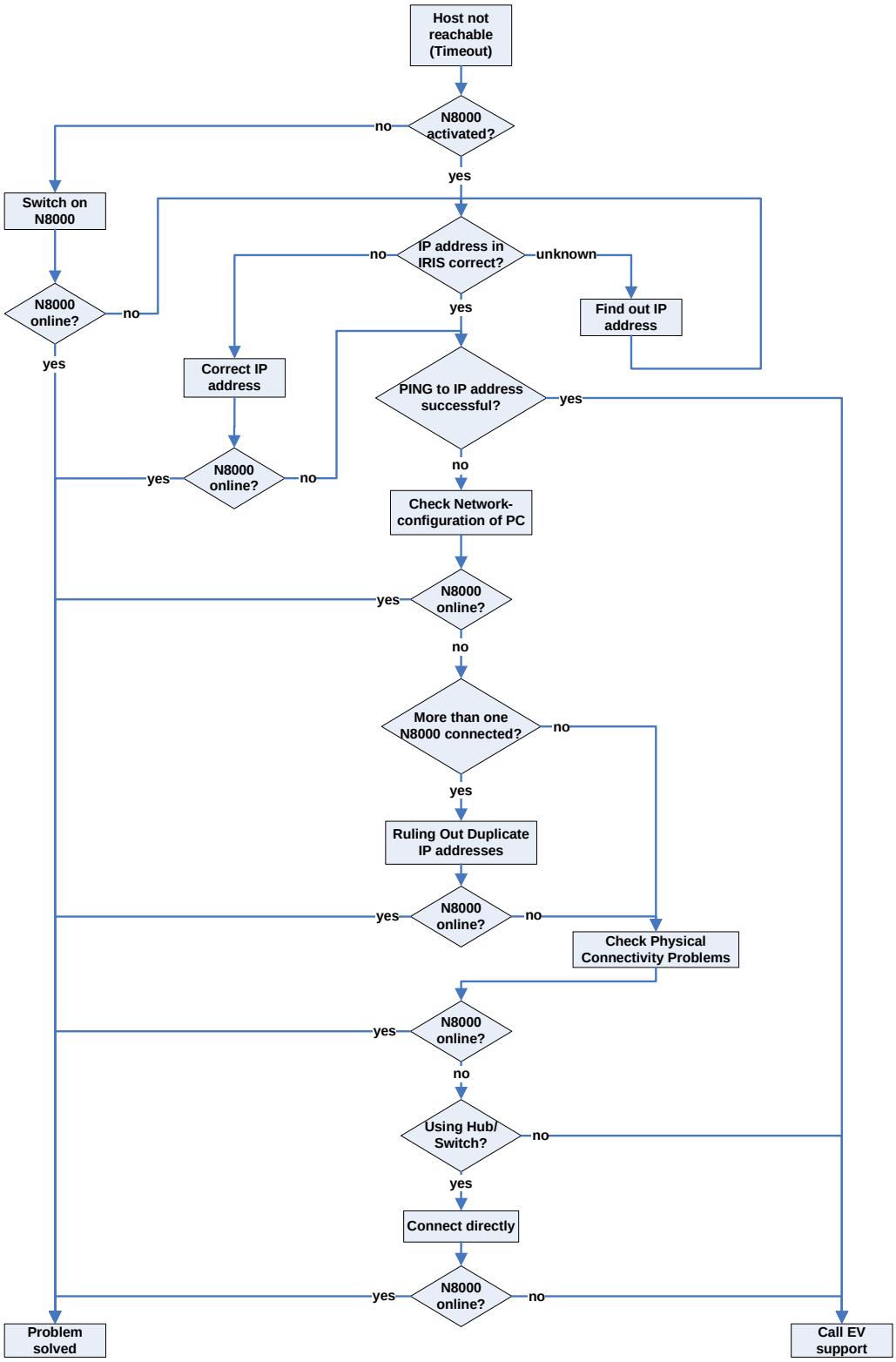
Two different methods are designed in order to operate and control the system. The first possibility is a conventional PC where the IRIS-Net (Intelligent Remote & Integrated Supervision) software is used to operate the N8000 and the remote amplifiers. It is not only possible to operate and control the system via IRIS-Net, but also to monitor the whole system. The N8000 and the PC are connected via Ethernet. Connecting a touch panel (e.g. AMX™, Crestron™) to the RS-232-interface of the N8000 is the second possibility for the operation of the system. The desired functions of the system can be accessed via the special operating interface of the touch panel.



Installation in a multi-purpose hall

5.2 Troubleshootings

Problem: It is not possible to establish a connection with the N8000 via IRIS-Net.



Check Network Configuration of PC:

Check the network configuration of the used PC. Remember that the network part of the used IP addresses that is used and the subnet mask of the PC and the N8000 have to be identical.

Ruling Out Duplicate IP-Adresses:

It is possible that the same IP address is allocated twice if there are more devices in an Ethernet network and if the IP addresses are allocated manually. Switch off the N8000 and try to ping the IP address of the off-state N8000 via a command line prompt (see page 30 of this manual). If the ping is successful, another device has the address of the off-state N8000. In this case, change the IP address of the device which is now answering or of the N8000 with the duplicate address (then you also have to change the IP address of the N8000 in IRIS-Net).

Check Physical Connectivity Problems:

When the PC and the N8000 are connected physically via the Ethernet, the following points have to be checked:

- Is the network cable undamaged and plugged in correctly?
- Is - if necessary - a crossover cable used?
- Do the indicator lights of the network socket of the PC, the N8000 and (if available) of the network devices between the PC and the N8000 glow after the network cable(s) has/have been plugged in?
- Is a problem indicated on the used network interface in the system control devices of the operating system?

Connect directly:

Establish a direct connection between the PC and the N8000 via a crossover cable in order to rule out internal problems in the network devices between the PC and the N8000. If an IP address had been set up automatically (DHCP) via a network device which is now no longer connected, this address has to be set up manually again.

5.3 Ethernet principles

The N8000 system controller can be connected to an Ethernet network via the Ethernet interface (RJ-45) on the rear panel. Ethernet is a computer networking technology for local networks. It is possible to connect two devices (hosts) directly via a crossed Ethernet cable (crossover cable) if this is necessary. If more than two devices have to be connected, they have to be connected via normal Ethernet cables (straight through cables) and a central node (hub or switch). For this purpose the central hub or switch has an extension (port) for every network member. The Ethernet interface of the N8000 is compatible with the following Ethernet standards:

- 10Base-T (IEEE 802.3i): Four wires (two twisted pairs) of CAT-3 or CAT-5 cables are used for this connection. The transfer rate is 10 MBit/s and the maximal length of a segment is 100 meters.

- 100Base-TX (IEEE 802.3u): Two twisted wire pairs are used for the connection (see above). However, in this case, a CAT-5 cable has to be used. 100Base-TX has a transfer rate of 100 MBit/s and is the standard Ethernet implementation nowadays.

IP addresses

Diverse network protocols can be used for the communication of the devices connected to the Ethernet network. The N8000 uses the TCP/IP protocol, thus, it is an IP network device. IP addresses are used for the logical addressing of devices in an IP network. The N8000 uses version IPv4 (Internet protocol version 4) for the addressing. Therefore, the length of an IP address is 32 bit (= 4 Byte). 4.3 billion unique addresses are theoretically possibl with this protocol. Normally IPv4 addresses are given in the dotted decimal notation, i.e. the four bytes are written as four decimals separated by dots. Thus, the general notation of an IPv4 address is AAA.BBB.CCC.DDD. An example of an IP address is 130.009.122.195. Zeros which stand in the first place can be omitted. That is the reason why the exemplary address can also be written as: 130.9.122.195.

The following table shows address sequences that should be used in private networks.

Class	Adress space	Subnet mask	CIDR	Number of IP addresses
A	10.0.0.0 - 10.255.255.255	255.0.0.0	10.0.0.0/8	16777216
B	172.16.0.0 - 172.31.255.255	255.240.0.0	172.16.0.0/12	1048576
C	192.168.0.0 - 192.168.255.255	255.255.0.0	192.168.0.0/16	65536
Link local	169.254.0.0 - 169.254.255.255	255.255.0.0	169.254.0.0/16	65536

Private IP addresses are especially of interest in networks which are connected to the Internet. Private IP addresses are not routed in the Internet. Thus, it is necessary to make an address conversion with NAT (Network Address Translation) or PAT (Port Address Translation = NAT and additional change of the port number) in order to be able to access the Internet. An benefit of this is that it is possible to connect several devices via a router with the Internet even when your Internet provider has only allocated one IP address. Additionally, the real IP address of the devices can be hidden from hackers by NAT/PAT (Security through Obscurity).

Subnet mask

An IP address is always divided into a network part (network address/ID) and a host part (host address/ID or device address). Devices are in the same network if, and only if, the network parts of their addresses are identical. Devices can interact directly with each other if they are in the same network. Ancillary equipment (e.g. a router) is necessary if devices in different networks should interact. Within one network host addresses may not be allocated twice.

For example, a network could e.g. split the 4 Byte (32 bit) of an IP address in a 3 Byte long network part and in 1 Byte long host part. The exact partitioning between network part and host part is given in the form of subnet masks. In this case, the partitioning of the first 24 bits or the last 8 bits would be made because of the subnet mask 255.255.255.0.

The CIDR notation which is designed to display a subnet mask is an alternative to the dotted decimal notation. So called suffixes are used in the CIDR notation. The suffix indicates the number of 1-bits in the subnet mask. Thus, the subnet mask 255.255.255.0 in dotted decimal notation would correspond to the suffix /24 as the first 24 places (in binary description) of an IP address are chosen as network address.

It is possible to impact the maximum number of the devices addressable within a network by choosing the subnet mask which results in different partitioning of the IP address in network part and in host part. For the exact number it has to be considered that the host part may neither be completely zero nor completely 1 in the binary description.

Example: In case of the above-mentioned example IP address 130.9.122.195 the network part would be 130.9.122.0 by using the subnet mask 255.255.255.0. So, each device (or interface) in the considered network uses an address of the type 130.9.122.DDD. As the values 00000000 and 11111111 are excluded for the host part DDD in binary description, the corresponding decimal values 1 to 254 for DDD are allowed. Thus, a maximum of 254 different devices can be addressed in a network and the corresponding addresses are 130.9.122.1 to 130.9.122.254.

Automatic/Manual Allocation of IP Addresses

IP addresses can be allocated both automatically and manually to a device in a network. If the address is allocated automatically via DHCP (Dynamic Host Configuration Protocol), the operation of a DHCP server in the network is necessary. This server makes it possible to dynamically allocate an IP address and additional configuration parameter to hosts in a network. The use of a DHCP server is especially useful for networks in which devices are often connected and removed.

If DHCP is used, certain incidents (e.g. the reboot of a device) can result in the change of the IP address of this device. If this device is a N8000 system controller, its configuration in IRIS-Net has to be modified to reflect the changed IP address. *For that reason it is not advisable to use DHCP for the dynamic configuration of N8000.* Instead, of that the network configuration of the N8000 should be done manually.

When a new Ethernet network which will not be connected to the Internet is established, any network part of the IP addresses can be defined. By choosing the appropriate subnet mask it is possible to adapt the number of the addressable devices to your requirements.

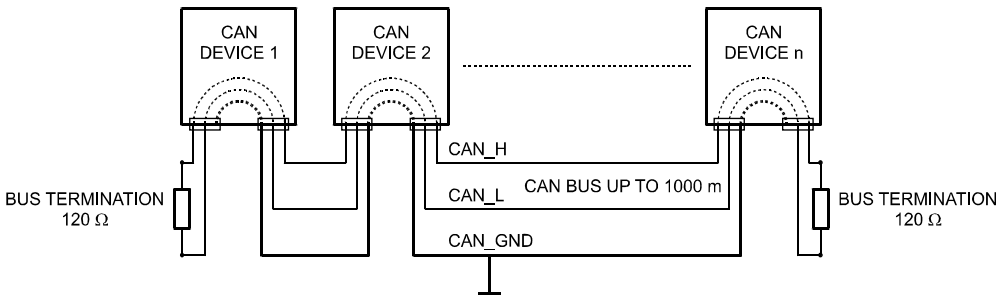
Please contact your network administrator regarding details on the correct network configurations if one or several N8000 is/are integrated in an existing Ethernet network (with or without DHCP server) or if the network is connected to the Internet.

5.4 CAN-Bus Principles

The network topology used by the CAN bus is based on the so-called “bus or line topology”, i.e. all participants are connected via a single two-wire cable (Twisted-Pair cable, shielded or unshielded) with the cabling running from one participant on the bus to the next, allowing unlimited communication among all devices. In general, it does not matter if the bus member is a power amplifier, a N8000 or a UCC1 USB-CAN converter. Thus, the N8000 can be connected at any place of the CAN bus. In total, up to 100 devices can be connected to one CAN bus.

The CAN bus has to be terminated with a 120 Ω terminating resistor at both ends. If the termination is missing or an improper resistor value is used, network errors can occur as a signal is reflected on the bus at both bus ends. Because of the superposition of the reflection with the original signal, the original signal is blurred. This may result in the loss of data. In order to prevent or minimize reflections at the bus ends, terminators are used as they "absorb" the energy of the signal.

Since the CAN interfaces of all EVI Audio appliances are galvanically separated from the rest of the circuitry, network cabling also carries a common ground conductor (CAN_GND) ensuring that all CAN-interfaces in the network are connected to a common ground potential.



Bus Topology of the CAN bus

By using a CAN bus repeater a connection between two independent and self-contained CAN bus systems can be created. Thus, the following can be achieved:

- Increase of the max. number of members

  A maximum of 100 devices can be connected to one CAN bus. This number can be increased up to 250 by connecting several CAN bus systems. This limitation of exactly 250 devices results from the addressing scheme used by the CAN bus. The addressing scheme allows the allocation of a maximum of 250 different CAN device addresses.

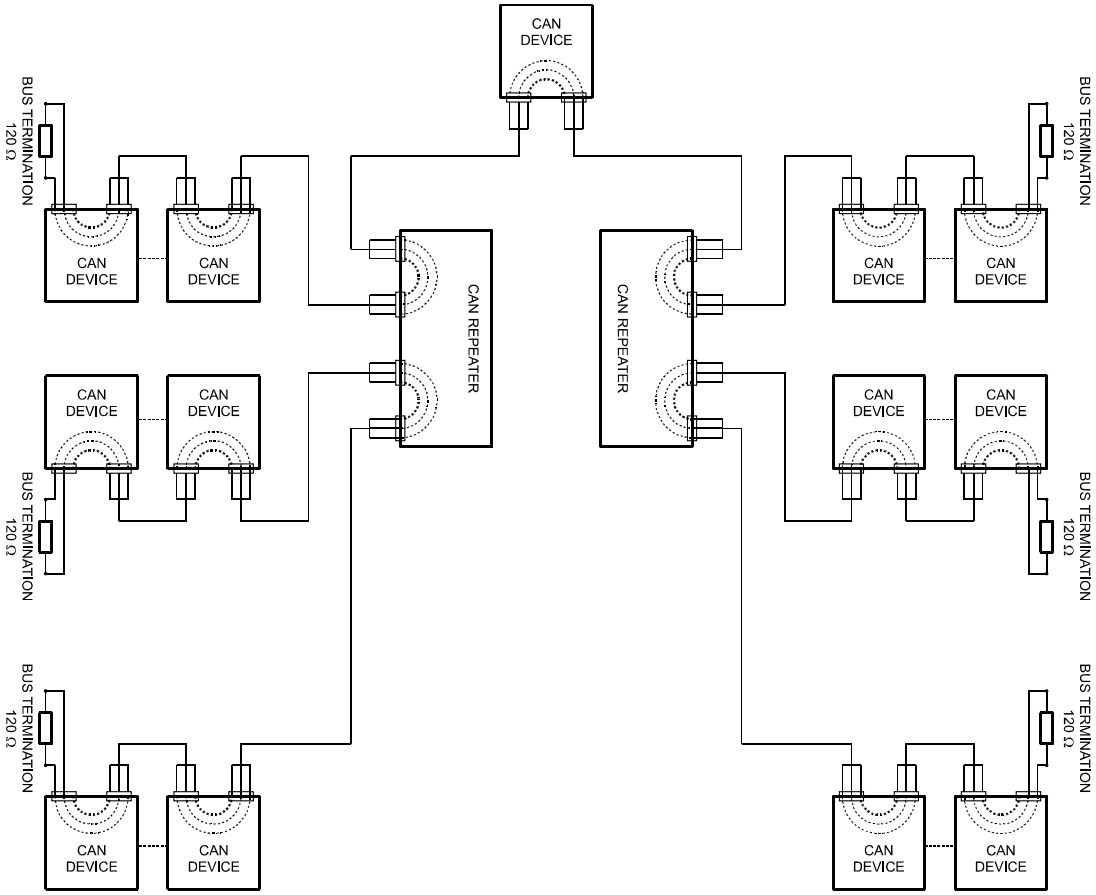
- Improvement of signal quality

  With CAN bus systems, whose bus length exceeds 1000 meters, a CAN bus repeater should be used. The CAN bus repeater accomplishes a signal processing and a reinforcement of the

bus signals. The internal running time of the repeaters of approx. 150 ns corresponds to an extension of the bus over approx. 45 meters.

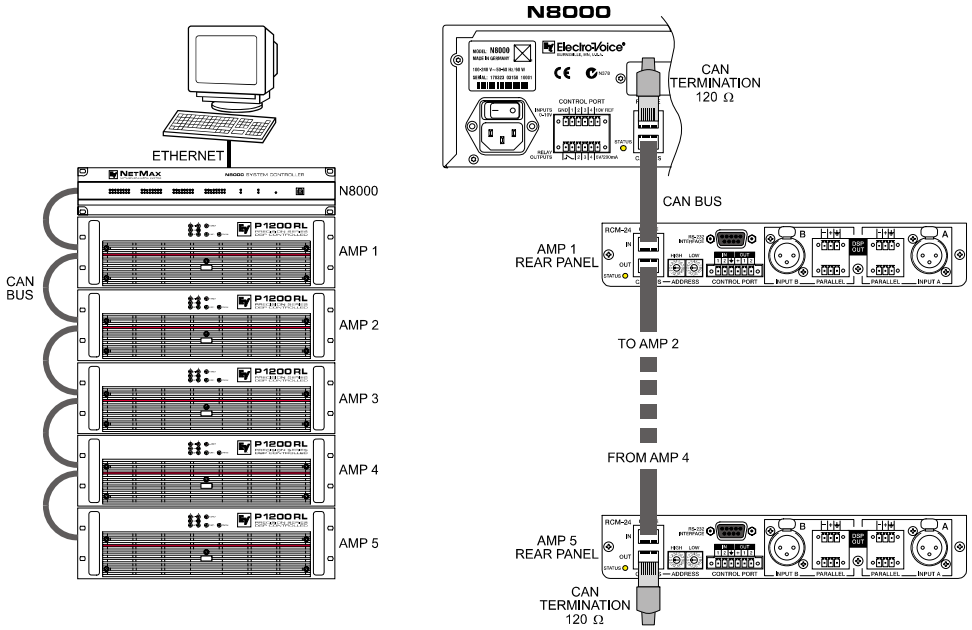
- Creation of alternative network topologies

  By using one or several repeaters, not only the above-mentioned bus topology, but the creation of other network topologies are also possible. In the following figure a star topology from three independent CAN bus systems is given as example. The three CAN buses are connected via two repeaters.



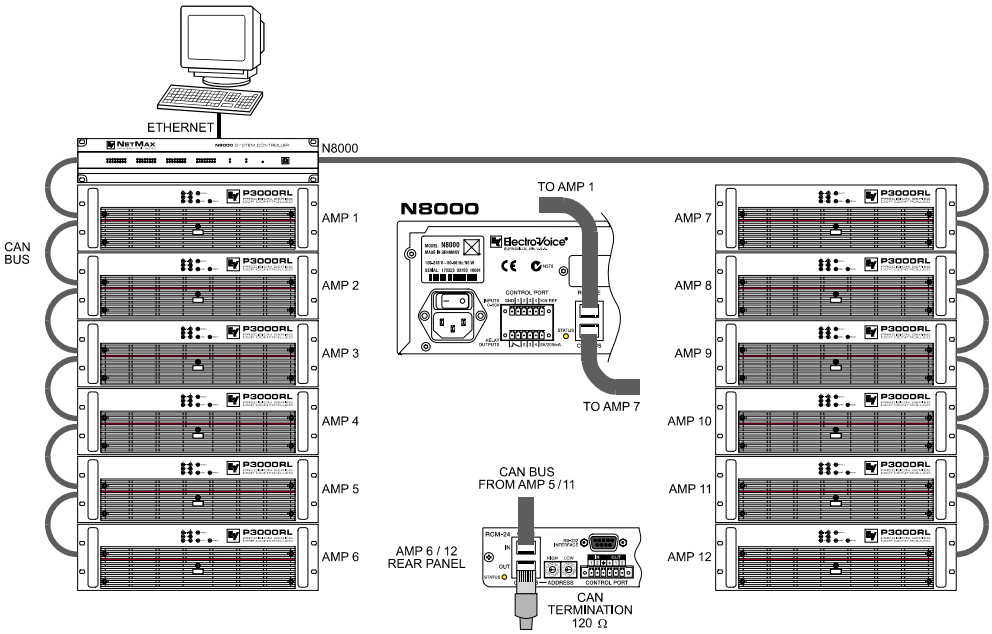
System Examples

The following illustrations show examples of the data-bus wiring for different sizes of CAN-bus networks..



System with 5 power amps and 1 N8000 at the beginning of the bus. Termination plugs at the N8000 (first unit on the bus) and at amp 5 (last unit on the bus).

.



System with 2 amp-racks and 1 N8000/PC in the middle. Termination plugs at power amp 6 (first unit on the bus) and power amp 12 (last unit on the bus).

Performance Specifications

According to the ISO 11898-2 standard, CAN-bus data transfer cabling has to be carried out using Twisted-Pair cables with or without shielding providing a characteristic impedance of 120 Ω. Both ends of a CAN-bus need to be terminated with 120 Ω termination-plugs. The maximum bus-length depends on the actual data transfer rate, the kind of data transfer cable being used, as well as the total number of participants on the bus. The following table shows the most essential requirements for CAN-networks consisting of up to 64 participants.

Bus Length (in m)	Date Transmission Cable		Termination (in Ω)	Max. Data Transfer Rate
	Resistance per Unit Length (in mΩ/m)	Cable Diameter		
0...40	< 70	0,25...0,34 mm² AWG23, AWG22	124	1000 kbit/s at 40 m
40...300	< 60	0,34...0,6 mm² AWG22, AWG20	127	500 kbit/s at 100 m
300 ... 600	< 40	0,5...0,6 mm² AWG 20	150...300*	100 kbit/s at 500 m
600...1000	< 26	0,75...0,8 mm² AWG 18	150...300*	62,5 kbit/s at 1000 m

* With longer cables and many participants on the CAN-bus, termination resistors with higher impedance than the specified 120 Ω are recommended to reduce the ohmic load of the interface drivers and therefore the voltage drop between the two cable-ends.

The following table is meant for first assessment of necessary cable diameters for different bus lengths and bus-participant numbers.

Bus Length (in m)	Number of Units on the CAN-Bus		
	32	64	100
100	0,25 mm² bzw. AWG24	0,34 mm² bzw. AWG22	0,34 mm² bzw. AWG22
250	0,34 mm² bzw. AWG22	0,5 mm² bzw. AWG20	0,5 mm² bzw. AWG20
500	0,75 mm² bzw. AWG18	0,75 mm² bzw. AWG18	1,0 mm² bzw. AWG17

Additionally, the length of branch lines - for participants that are not directly connected to the CAN-bus - is also of importance. For data transfer rates of up to 125 kbit/s, the maximum length of a single stub cable should not exceed 2 meters. For higher bit rates a maximum length of only 0.3 meter is still permissible. The entire length of all branch lines should not exceed 30 meters.

General Note:

- As long as only short distances (up to 10 meters) are concerned, common RJ-45 patch cables with a characteristic impedance of 100 Ω (AWG 24 / AWG 26) can be used for the cabling inside of a rack mounted system.
- The previously outlined guidelines for network cabling are mandatory as far as the rack mounted shelve interconnection or fixed installations are involved.

5.5 IP Address Table

Project: _____

Subnet mask	
Gateway	

Device	IRIS-Net Device Name	Location / Description	IP Address

6.1 Specifications/Technische Daten

GENERAL DESCRIPTION AND FEATURES	
N8000 System Controller	Modular NetMax system manager including signal processing, routing, system control and supervision
Audio	32 Audio Channels 4 Audio Slots, modular 8-Channel Input and Output cards, analog or digital
Networking	Module Slot for optional CobraNet™ Interface 32 I/O Audio and Control
Safety / Redundancy	Internal Supervision, System Monitoring, Watchdog, Fault Output, Redundant Audio Network possible
PC Configuration and Control Software	IRIS-Net - Intelligent Remote & Integrated Supervision Integration of N8000, Remote Amplifiers, peripheral control Configuration, Control and Supervision for complete Audio Systems Freely programmable User Control Panels and Access Levels

AUDIO SPECIFICATIONS	
Audio Inputs - Analog Input Module AI-1	8 analog audio inputs per module, line level, electronically balanced
Connectors	8 x 3-pole Euro block connectors
Input Level (nominal)	+6 dBu / 1.55 V
Input Level (max. before clip)	+21 dBu / 8.7 V
Input Impedance	20 kΩ
Common Mode Rejection	> 70 dB
A/D Conversion	24 Bit, Sigma-Delta, 128 times oversampling
Audio Outputs - Analog Output Module AO-1	8 analog audio outputs per module, line level, electronically balanced
Connectors	8 x 3-pole Euro block connectors
Output Level (nominal)	+6 dBu / 1.55 V
Output Level (max. before clip)	+21 dBu / 8.7 V
Output Impedance	100 Ω
Min. Load Impedance	600 Ω
D/A Conversion	24 Bit, Sigma-Delta, 128 times oversampling
Frequency Response	20 Hz...20 kHz (-0.5 dB)
Signal to Noise Ratio (A-weighted)	AI-1: 117 dB typical AO-1: 118 dB typical N8000 analog In to analog Out: 115 dB typical
THD+N	< 0.005 %
Signal Delay	AI-1: 1.3958 ms AO-1: 0.646 ms N8000 analog In to analog Out: 2.2917 ms
Crosstalk	< -110 dB @ 1 kHz

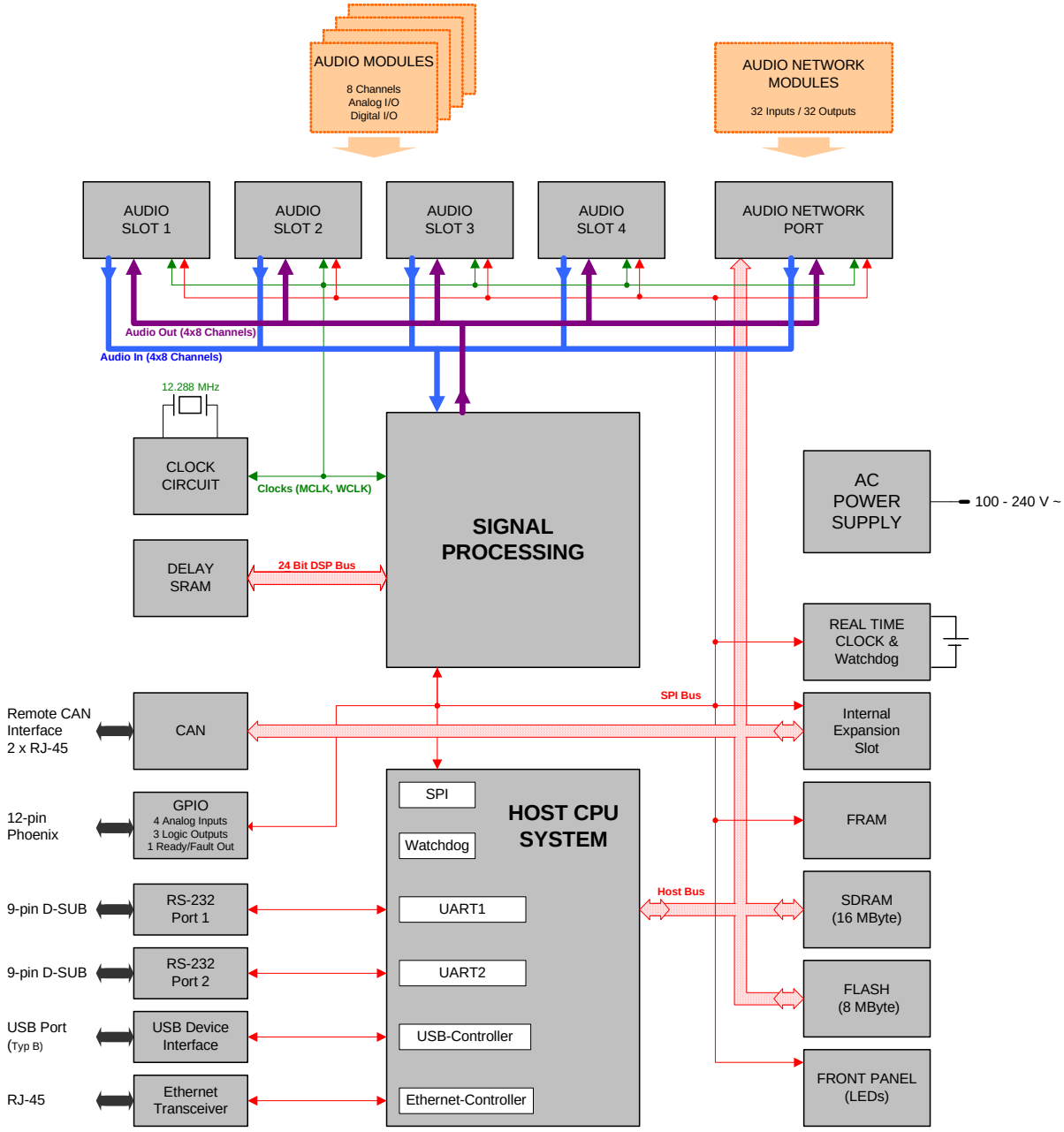
SIGNAL PROCESSING	
Sample Rate	48 kHz internal 32 kHz - 192 kHz external
Data Format	24 Bit linear A/D and D/A conversion, 48 Bit processing
Signal Processing	2 DSPs Standard (150 MHz, 300 MIPS) 1 DSP per Audio Module (100 MHz, 100 MIPS) DSP-1 Extension Module optional (+300 MIPS)

INTERFACES	
Ethernet	10 / 100 MBit/s, RJ-45 (PC Control)
CAN	10... 500 kbit/s, 2 x RJ-45 (Remote Amp Control)
RS-232	2 Ports, 9pin D-Sub female (Remote Control)
USB	USB Type B on Front Panel (PC Control)
GPIO Control Port	2 x 6-pole Euro block 4 Control Inputs (analog 0 - 10 V / logic control) 3 Control Outputs (Relay contact to ground) 1 Fault Output (NC Relay contact) 3 Reference Outputs (+5 V / +10 V / GND)

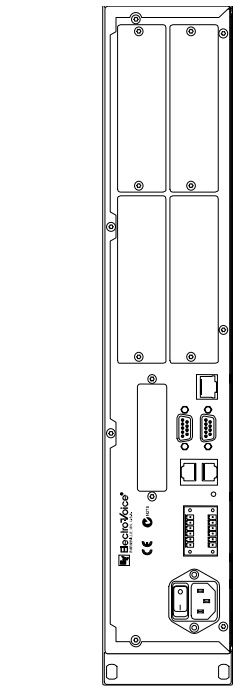
N8000 GENERAL SPECIFICATIONS	
Power Supply	100 - 240 V AC, 50/60 Hz
Power Consumption	90 W max. (incl. 2 x AI-1, 2 x AO-1, 1 x CM-1 modules)
Safety Class	I
Cooling	Left-to-right, 3-stage fan
Operating Temperature Range	0 °C ... 40 °C
Dimensions (W x H x D)	483 x 88.1 x 381 mm (19“, 2 HU)
Weight	N8000 (without optional modules): 7.35 kg AI-1 Analog Input Module: 200 g AO-1 Analog Output Module: 260 g CM-1 CobraNet™ Module: 75 g

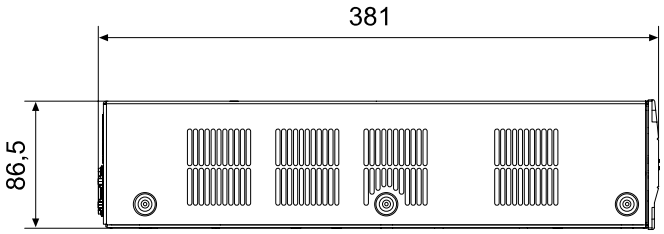
MODULES / OPTIONS	
AI-1 Analog Input Module	8 analog audio inputs, line level, electronically balanced
AO-1 Analog Output Module	8 analog audio outputs, line level, electronically balanced
CM-1 CobraNet™ Module	32 digital audio inputs and outputs, 2 CobraNet™ ports (Primary / Secondary) for network redundancy
DSP-1 DSP Extension Module	Internal DSP processing power and Delay-RAM extension, 300 MIPS, 256k x 24 SRAM
MI-1 Microphone Input Module	8 microphone inputs, programmable Gain and Phantom Power, PAD for line level switching
DI-1 Digital Input Module	8 digital audio inputs, AES/EBU, S/PDIF and Optical formats, sample rate converters for 32-192 kHz operation

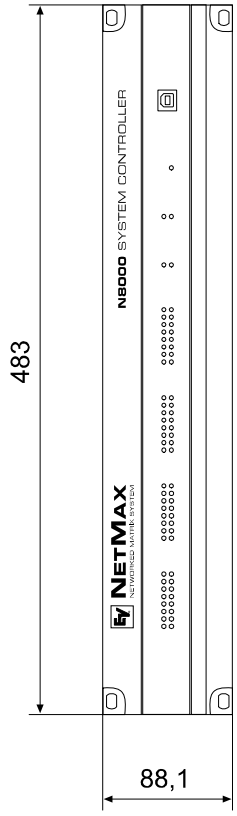
6.2 Block Diagram/Blockschaltbild

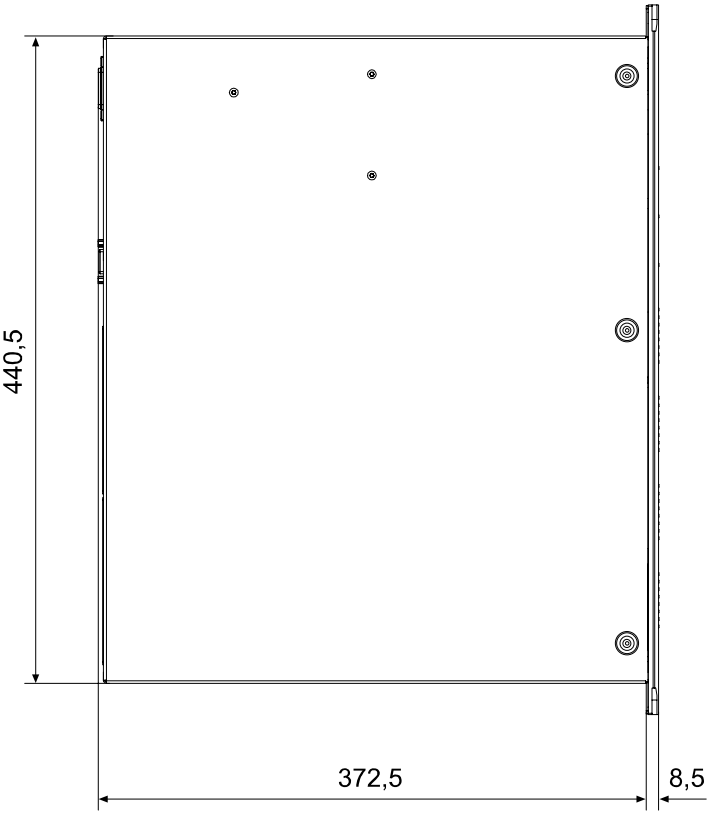


6.3 Dimensions/Abmessungen









Notes

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USA: Telex Communications Inc., 12000 Portland Ave. South, Burnsville, MN 55337, Phone: +1 952-884-4051, FAX: +1 952-884-0043
Germany: EVI Audio GmbH, Hirschberger Ring 45, D 94315, Straubing, Germany, Phone: +49 9421-706 0, FAX: +49 9421-706 265
France: EVI Audio France, Parc de Courcerin, Allée Lech Walesa, 77185 Lognes, France, Tél : +33 1 6480 0090, FAX: +33 1 6006 5103

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